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SIXTH QUARTERLY REPORT FOR EQUIVALENT SOURCE MODELING OF THE MAIN FIELD USING MAGSAT DATA

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FOR THE PERIOD

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SUBMITTED TO

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
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During this quarterly period, the following modeling and software development work has been done:

1. Magsat dipole solution models have been obtained with both 32° and 21° resolution based on a data set extending over 4 months (November 5, 1979 - March 15, 1980). Time dependence was modeled using first time derivatives for the dipole magnetization vector components. This doubles the total number of parameters in the solution. The solutions displayed a very slow convergence in time derivatives (the derivatives had very large magnitudes), although at each iteration the conversion of the dipole parameters to spherical harmonic coefficients g_{nm}, h_{nm} and $\dot{g}_{nm}$, $\dot{h}_{nm}$ showed close agreement with the MGST(12/80) spherical harmonic model to degree 13 in the constant terms and 8 in the secular variation terms. The observability of the time variation of the individual dipoles over the short time period was poor, while the information content to the extent of determining the global time variation to degree 8 in spherical harmonics is very strong. A priori values for the geocentric dipole derivatives were obtained from $\dot{g}_{10}$, $\dot{g}_{11}$ and $\dot{h}_{11}$ and the solution was then statistically constrained for the geocentric dipole using these values. The convergence using this technique showed much improvement.

2. The program error in the option to simultaneously estimate observatory anomaly biases was found and corrected. A 32° resolution dipole model was generated using the selected magnetic observatory data from 1960 - 1977 used in the GSFC(9/80) spherical harmonic model. The dipole magnetization vectors (constant and first time derivatives) and the observatory anomaly vectors were included in the parameter state vector. The dipole time derivatives showed good convergence in the solution with data over the 17 year interval.

5. Production computer runs have been set up on STAND-BY priority on the 360/91 to compute 32° and 21° resolution models, solving for dipole constant and first time derivative components and for observatory anomaly biases for

   a) the interval 1960 - 1980 using POGO, magnetic observatory and Magsat data

   b) the interval 1974 - 1980 using magnetic observatory and Magsat data.